

Some observations on the colour changes of the Indian Chamaeleon¹

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(With a plate)

INTRODUCTION

Chamaeleons are known for their ability to change colour rapidly. Interesting accounts on this aspect have been recorded by Hogben & Mirvish (1928), Hingston (1933), Zoond & Eyre (1934), Zoond & Bokenham (1935), Drimmer (1954) and Goin and Goin (1962). The work of these authors is on *Chamaeleon chamaeleon*, *C. pumilus* and *Lophosauria pumila*. In India, Trench (1912) recorded some observations on colour changes of the Indian Chamaeleon *Chamaeleon zeylanicus* Peters. However, these observations are casual and scanty.

In the present study, a young *C. zeylanicus* was collected on Rani Durgavati Samadhi road about 20 km south of Jabalpur. It was kept under observations in a large rectangular aquarium jar with branches of foliaceous shrubs. The animal was fed on grass-hoppers and water was provided by sprinkling on the branches. When the animal was seen adapted to captivity, the experiments on the colour changes were carried out.

OBSERVATIONS

The experiments were conducted under a fluorescent tube and white, yellow, red, blue and green backgrounds obtained by pasting translucent coloured papers on the experimental jar. Observations were made from a small window left at one corner of the jar. The experiments were also conducted in coloured lights by employing colour-

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ed bulbs of 40 watt power. Out-door observations were made against the background and surroundings of green grass, yellow flowers and foliage of different shades. Several experiments spread over two days, were conducted for each background, colour and environment and only the results obtained consistently have been summarised in this paper.

Observations were also made for the whole day beginning from sun-rise to sun-set and twilight. At the end, some experiments were carried out by covering the eyes of the experimental Chamaeleon to study the role played by vision on the change of colour.

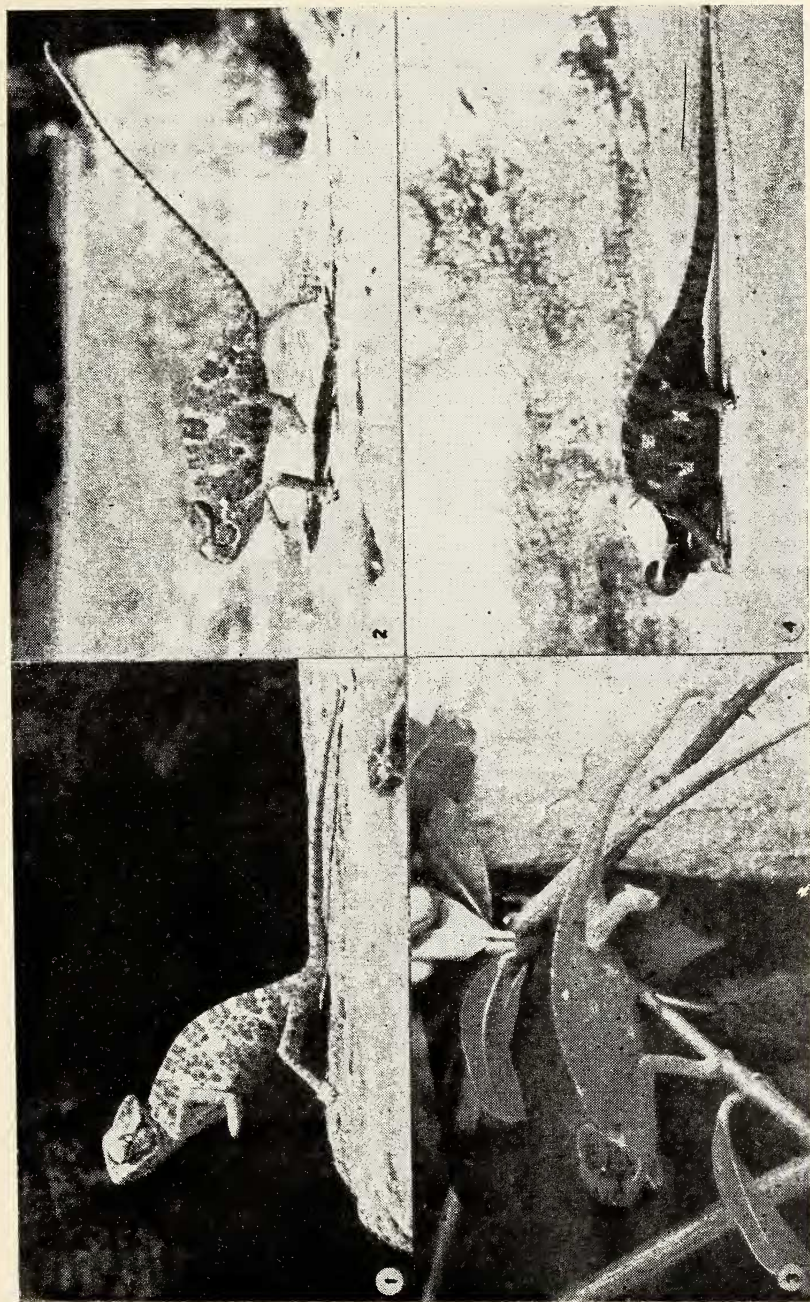
Experiments with different backgrounds

These experiments were conducted against white, red, yellow, blue and green backgrounds. The general pattern of the change of colours against these backgrounds is summarised in Table 1. The change in any colour pattern took about 3 to 4 minutes. There were minor deviations from the general pattern of the colour changes. These are given below.

TABLE 1

GENERAL PATTERN OF COLOUR CHANGES IN *C. zeylanicus* IN DIFFERENT BACKGROUNDS AND LIGHTS

Background/light	Colour pattern
DIFFERENT BACKGROUNDS	
White	Pale green with irregular blackish spots.
Red	Pale green with intermittent appearance of blackish spots.
Yellow	Dark green with black spots. Within 5-8 minutes, the black spots disappeared leaving the animal dark green.
Blue	Dark green. Black spots appeared for a short time.
Green	Dark green, perfectly matching the background. At times, pale green with light yellow bands.
DIFFERENT LIGHTS	
Red	Dark grey with light black spots. The side nearer the light darker than the opposite. Occasionally, black spots darkened and faded.
Yellow	Pale lemon yellow over the body and pale green on head.
Blue	Green with occasional black spots.
Green	Green with occasional black spots and yellow rings.



Figs. 1 & 2. The colour pattern assumed in sunlight in the natural environment. Fig. 3 The colour pattern assumed in cover to simulate the surroundings of foliage and sunlight passing through the leaves. Fig. 4. Chamaeleon with eyes covered with rubber teats.

In white background on two occasions, the black spots became darker and the semi-circular lemon yellow rings appeared on the sides of the animal excluding its head. On tail, the rings were replaced by yellow vertical bands. When the light was switched off, the blackish spots on the body disappeared save a few small and lighter ones on the abdomen.

In red background, at one time, yellow spots of the size 8-10 mm appeared on the body along with vertical yellow bands on the tail. The spots on the body slowly changed to rings which later disappeared giving the chamaeleon the usual pale green colour with blackish spots.

In yellow background in the third experiment in the series, lemon rings appeared on the green body-colour in addition to black spots. The rings alternated the black spots. On tail, light yellow vertical bands alternated with pale green patches. Once the horizontal white stripes appeared on the body for a few seconds.

In blue background when the animal expanded its thorax, the portion in between ribs turned pinkish and later became light lemon yellow within a very short period. In the green background in one experiment, black spots appeared on the body momentarily.

Experiments with different lights

The general change of colour pattern in different lights for the chamaeleon under investigation is also summarised in Table 1. As in the case of backgrounds, there were some minor deviations in colour changes in these series of experiments. In yellow light in one experiment, the colour remained deep green. In blue light, the black spots used to disappear when the animal was at rest. On some occasions, the black spots alternated the yellow rings on the body while the tail remained green with vertical yellow bands. It may be mentioned here that the animal showed considerable movement in blue light.

Observations in natural environment

These observations were made from dawn to dusk. The temperature ranged from 27.5°C at 7.00 hrs to 35.6°C at noon and at 19.15 hrs it dropped to 26.2°C. The chamaeleon was allowed to move freely on a green shrub, grass, dried grass-land, stones, bricks etc., both in the shade and bright sun-light. Observations were made from a distance of more than 25 feet with a pair of binoculars and are summarized in Table 2. The changes in colour pattern could also be seen in Plate 1, Figs. 1 and 2.

Besides the colours shown in the Table 2, some interesting observations were made in this study. When a small bird landed on a branch of the shrub on which the chamaeleon was perching, the latter immediately developed dark black spots on the body and expanded its trunk assuming a grotesque posture. To avoid bright sunlight the animal entered thicker foliage. The colour pattern of dark green with

yellow spots developed at this time, is perhaps to simulate the surrounding foliage and the sun-light passing through the leaves. The side of the body facing the sun was darker than the other (Plate I, Fig. 3). Amongst the large yellow flowers of *Allamanda cathartica*, the colouring was so perfect that the animal was indistinguishable from a distance.

The observations in the natural environment tend to suggest that there is a daily colour rhythm in chamaeleon depending upon the weather, condition of light etc. This supports the observations of Waring (1963).

Observations with the animal's eyes covered

In order to study the role of vision in the change of colour in the chamaeleon, separate experiments were carried out. For the purpose, black ink dropper teats were cut to suitable size, smoothened by sand paper and fixed to the projecting eyes so as to cover them completely. They were further secured in position with the help of adhesive tape (Plate I, Fig. 4). This gave considerable discomfort to the chamaeleon and it tried to remove these by its forelimbs and rubbing its head against floor and sides of the experimental jar. The animal became disoriented and started walking backward and walking in circles when the eyes were capped.

The animal with its closed eyes was exposed to sun and also to the green, yellow, blue and red lights. The colour changes observed in these experiments are reported in Table 2. Here again, the side of the body nearer the source of light was darker than the opposite side. In the sun-light the colour changes to usual dark grey (Plate I, Fig. 4). There were thus slight deviations in the colour changes when the eyes were closed (Table 1 & 2). This tend to indicate the role of eyes along with the skin in the change of colour. This supports the views of Sand (1935), Drimmer (1954) and Portman (1959), that colour change is related to light, heat, emotional state and background colour.

General observations on colour changes

At times the grass hoppers given as food would sit on the back of the chamaeleon which would then turn grey or deep grey. The same reaction was given when the table on which the experimental jar rested was tapped or the animal touched by a glass rod. The animal was alive for five and half months. About 12 days before its death, it refused food and water and assumed lemon yellow colour which rarely changed. During these last twelve days it remained motionless closing its eyes. Even in this condition, it changed its colour to greyish in sunlight but not to black or deep grey as usual. In shade, it developed green patches on the general lemon colour. The colour of the body at the time of death remained lemon yellow all over.

Sand (1935) recognized five stages of progressive darkening in